

# SCIENCE & EDUCATION Impact

Benefits from USDA/Land-Grant Partnership

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## Energy Abounds ... From the Farm

Biofuels and other plant-based products touch many areas of life.

*Rising fuel and energy costs are a pain in the pocketbook and threaten to pinch Americans at home and at the gas pump. The country's heavy reliance on fossil fuels took root in the 20<sup>th</sup> century, revealing itself in the vehicles we drove and the ways in which we heated our homes and cooked our food. The USDA and land-grant partnership is helping develop the new "bioeconomy," where renewable farm crops are the basic building blocks for producing consumer goods and energy.*

### Payoff

- **Nice new genes.** Researchers at **Purdue** added three genes to the structure of baker's yeast that allow it to more efficiently convert plant sugars to ethanol. The new yeast strain will increase ethanol production from straw by 40 percent, making a product that is more cost-competitive with gasoline.
- **All tanked up.** **Iowa State** researchers are broadening the use of lignocellulose, a compound that gives woody plants their strength, in ethanol production. Lignocellulose is naturally renewable, low-cost, and can meet 10 percent or more of the country's transportation needs. Colleagues at **Colorado State** recently began using acid pretreatments on lignocellulose to develop cleaner-burning fuels. Their work has led to the introduction of fuel ethanol at many of the state's gas stations, helping reduce air pollution.
- **The efficiency of corn.** Corn sometimes gets a bad rap as a raw material for ethanol. But **Nebraska** research shows corn ethanol yields 30 percent more energy than it takes to produce it. It's an important finding, since about 25 percent of all Nebraska corn is used for ethanol, a key industry for rural economies.
- **Don't waste that waste.** Researchers in **Arkansas** may have the latest scoop on chicken waste. They are testing on-farm technologies that will convert chicken litter to thermal energy and heat chicken houses, displacing expensive fossil fuels and saving money for farmers. One private company is adapting a cordwood furnace to burn litter. **Utah State** researchers and students have engineered a waste system

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for dairies that reduces odor and groundwater threats. The system also produces a biogas that can be used for electricity or heat.

- **New Frontiers?** Land-grant and USDA scientists are involved in new ways to develop energy alternatives. **Delaware** researchers have established a hybrid poplar and warm-season grass biofuel plantation to study oil and gasoline alternatives. Working with the Delaware State Energy Office, the scientists say the alternatives provide a plentiful fuel supply with no harm to the environment. **Illinois** and **Tennessee** researchers are investigating the use of switchgrass as a biofuel. The Illinois study indicates switchgrass and other perennial grasses can provide enough fuel for half of that state's current electrical use. In **Georgia**, researchers are testing poultry fat, grease, and tallow for fuel properties. They have concluded that biofuels from these products are less hazardous than petroleum fuels and provide added income for the Georgia poultry industry.
- **Good for the body, too.** **Arkansas** researchers are treating plant material from the mimosa tree with enzymes to produce gas that can be converted to ethanol. But they have also found that health compounds with antioxidant properties can be extracted from the mimosa and safely added to human or animal food.
- **Bio-cars.** **Michigan** researchers developing soy-based plastics and grass fiber have drawn the interest of Ford Motors, which has targeted this by-product for interior detailing in 90,000 vehicles. The project would require 3.6 million pounds of biocomposite materials valued at \$3.6 million. **Virginia Tech** researchers say that because of the performance, light weight, and low cost of wood pulp, the automobile industry is considering making vehicles with a wood fiber content five times higher than the current level of 30 pounds per car.
- **Wise use of forest resources.** Scientists and extension staff in **Alaska** helped three communities in forested areas use their wood and the local work force to decrease their reliance on diesel. Their effort helped these towns satisfy the state legislature's mandate to explore carbon markets. The amount of emissions saved from not burning diesel could potentially earn

credits that could be sold on emerging markets for carbon emission credits, the researchers say. **Tennessee** researchers have created commercial fiberboard panels from previously useless forest thinnings and recycled corrugated containers, using two-thirds less new material than particle board. **Mississippi State** scientists are developing an organic wood preservative from low-value pine trees, with fuel as a by-product. Their work takes advantage of plentiful timber resources while reducing dependency on foreign fuels and improving the nation's environmental health.

- **Bio-business on the rise.** Research and extension staff at **Iowa State**, have developed and commercialized bio-based technologies, directly benefiting at least 30 companies in the state. One example is Eco Lips, a Cedar Rapids company that produces an organic lip balm made from beeswax, soybean oil, and jojoba oil. Ongoing bio-based development efforts could create more than 16,000 jobs. A study by the Iowa Department of Economic Development shows that the state's investment in the nation's bioeconomy leverages roughly \$1.5 billion in federal dollars and matching funds from private businesses.



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